Astrobiology Drilling Program (ADP) – An international program of the NASA Astrobiology Institute

1.1 **Charter**. An international program, managed by the NASA Astrobiology Institute (NAI), aimed at coordinating continental drilling projects of astrobiological significance. The goals of the program are to assist in the identification of appropriate targets, the overseeing of procedures for sample distribution and curation, the modification of project plans and procedures where beneficial, and the promotion of worthwhile proposals to potential funding agencies.

1.2 **Rationale**. Research into the origin and early evolution of life on Earth has intensified during the last decade in concert with the rapid rise of astrobiology as an emerging discipline. Much has been learned about the nature and ages of crucial sedimentary successions but sampling for indicators of early life (microfossils, biomarker molecules, stable isotope ratios, organosedimentary structures, etc.) has been hampered by the limited availability of unweathered, unoxidized, and uncontaminated rock samples. The ADP will address this difficulty by providing a wealth of fresh samples from carefully selected geological settings. It will no longer be necessary to rely on the vagaries of natural processes to provide exposures of key intervals of Earth history. These include Earth's oldest sedimentary successions, critical intervals in Earth history, and times when the biosphere was changing in a planetary-scale fashion. This comes at a time when the field is energized by excitement and controversy over, for example, the history of the composition of the atmosphere, the oxidation states of the ocean, global glaciations, evidence for Earth's earliest life, and the evolution of microbial metabolisms. Equally important is the accelerating application of new biogeochemical tools ranging from whole genome sequencing, through compound-specific isotope geochemistry, to mass-independent stable isotope measurements. A plethora of recent research articles demonstrates the potential for innovative, multidisciplinary research of this kind through the development of the Astrobiology Drilling Program.

1.3 **Management**. The ADP will be managed by a Steering Committee that includes the Principal Investigators/Chief Scientists of recent drilling projects (or their nominees) plus members, including a Chairperson, appointed by the Director of the NAI. The steering committee will oversee the administration, coordination, and promotion of the program with assistance from the staff of NAI Central.

1.4 **Funding**. NAI expects to be able to support, with partial or supplementary funding, a limited number of projects for the first few years of operation. However, a principal goal is to use the demonstrated scientific value of the initial activities to enthuse other funding agencies to contribute to the program. It is also hoped and expected that projects funded entirely from other sources will join the ADP and, in the process, assist in the exchange of scientific knowledge, enlarge the impact of the ADP nationally and internationally, and benefit from the ADP's ability to provide assistance with negotiating permission to carry out the drilling

and overseeing the archiving of samples and core.

1.5 **Sampling protocols**. ADP cores should be obtained under the cleanest possible conditions in order to maximize the potential for preservation of biosignatures and, at the same time, be commensurate with the goals of the current investigators and future needs. Over time, the ADP will develop a set of recommended protocols for sample acquisition and storage. These might include snap freezing to preserve volatile compounds, the use of hydrocarbon-free drilling fluids to minimize biomarker contamination, the employment of non-magnetic methods to preserve paleomagnetic records, and the use of chemical or isotopic spikes to enable contamination to be quantified.

1.6 **Priorities for sample distribution**. Proposers of funded drilling projects should have sole access to their cores for some reasonable length of time. Discussion within the NAI community has resulted in a consensus policy that one year from the time that cores are delivered for scientific study represents the allowable embargo period. Exceptions to this policy may be possible for scientists not connected with the original project who propose during the "advertised phase" (§ 1.8) to undertake studies using novel techniques that were not part of the original research plan, or proposing non-competitive studies.

1.7 **Sensitivity to heritage concerns**. The NAI is committed to the protection of sites that might be impacted by the ADP program, to obtaining all necessary permits and permissions from local, regional, and national authorities as part of the planning process, and to the repatriation of all samples judged to be of scientific importance in their country of origin.

1.8 **Community access to core samples**. It is agreed that ADP project teams and their collaborators shall have exclusive access to their cores for one year after the drilling is completed. However, it is expected that project plans be well disseminated through usual channels (e.g., posters, talks, publications, websites) prior to the commencement of drilling so that members of the international astrobiology community may request: (1) immediate access for investigations that supplement the original project or not are viewed as competitive with it; or (2) access after the twelve month embargo period. Members of the NAI will have no special privileges in this regard. Requests for samples should be made to project leaders with copies sent to the Chair of the ADP Steering Committee.

1.9 **Core and sample repositories**. In addition to the cores and samples archived by organizations in the countries where the ADP holes are drilled, there is a need for one or more central facilities to provide archival storage for cores and samples from all projects. The ADP Steering Committee is exploring ways to develop one or more long-term storage facilities.

1.10 **Implementation of the ADP**. Two projects, The Archean Biosphere Drilling Project (ABDP) and the Deep Time Drilling Project (DTDP), are immediately

interested in adopting these policies and becoming the initial participant projects of the ADP. The ABDP, an international collaboration involving Kagoshima University, the Geological Survey of Western Australia, The University of Western Australia, and Pennsylvania State University NAI Lead Team. The plan is to drill seven short holes in the well-preserved Archean sedimentary successions of the Pilbara area of Western Australia. The Deep Time Drilling Project, which grew out of discussions within the NAI's Mission to Early Earth Focus Group, will follow with a long hole in the Hamersley Basin, Western Australia,in the Summer of 2004. Another long hole in the Pilbara (Coonterunah) is planned for the Summer of 2005. The DTDP is an NAI-wide activity involving members of the University of Washington, University of Colorado, and Harvard University teams.